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PART 2
REMEDIAL INVESTIGATIVE WORK
ON-SITE GROUNDWATER AND SOILS INVESTIGATION
PHASE I
TORRANCE, CALIFORNIA



HARGIS+ASSOCIATES, INC.
Consultants in Hydrogeology



1905

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REMEDIAL INVESTIGATIVE WORK
ON-SITE GROUNDWATER AND SOILS INVESTIGATION PHASE I
MONTROSE SITE
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PART 2
REMEDIAL INVESTIGATIVE WORK
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INTRODUCTION

This Sampling Plan has been prepared as part of the remedial investigation work being conducted at the Montrose site in compliance with a consent order (U.S. EPA Docket No. 85-04) entered into by the EPA and Montrose Chemical Corporation of California on October 28, 1985. This Sampling Plan describes the Phase I On-Site Groundwater and Soils Investigation, and includes discussion of the following:

- * Objectives of the sampling activities
- * Monitor well locations and construction
- * Soil sampling locations
- * Target chemicals
- * Groundwater and soil sampling methods
- * Number and frequency of sampling
- * Chain-of-custody procedures
- * Handling, storage and shipping procedures
- * Analytical methods
- * Quality Assurance

Detailed discussions of sampling procedures, methodologies, chain-of-custody and other quality assurance criteria associated with these efforts are presented in a separate companion document entitled:

QUALITY ASSURANCE PROJECT PLAN

PART 2
ON-SITE GROUNDWATER AND SOILS INVESTIGATION PHASE I
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TORRANCE, CALIFORNIA.

Phase I activities are directed toward further detailed investigations of on-site groundwater and soil conditions. Based upon an evaluation of the data collected during Phase I, a second phase of on-site and off-site groundwater and soils investigations may be conducted as specified in Appendix A to the consent order. If required, Phase II activities will be described in a subsequently developed sampling plan.

HISTORICAL BACKGROUND

The Montrose site occupies about 13 acres in Torrance, California (Figure 1). The area is bounded by Normandie Avenue on the east, Jones Chemical Company on the south, a vacant lot to the west, and the McDonnell-Douglas facility to the north (Figure 2). The surrounding area consists of mixed residential, commercial, and industrial zones. The Del Amo hazardous waste site, currently under investigation by the California Department of Health Services, is located about one-half mile southeast of the Montrose site.

Between 1947 and 1982, Montrose Chemical Corporation operated a DDT manufacturing facility at the site. In 1972, the use of DDT was banned in the United States. The use of DDT was not banned in other countries, and Montrose continued to manufacture and export DDT until 1982 when the facility was closed and completely dismantled. The Montrose site is now completely capped with asphalt which precludes any off-site migration of soils and prevents any direct recharge on-site.

Previous investigations of the Montrose site include on and off-site sampling of soils, groundwater, sediment and surface water. These investigations have been conducted by the U.S. EPA, its contractors, the California Department of Health Services, the Los Angeles Regional Water Quality Control Board, or Hargis + Associates, Inc., on behalf of Montrose. Reports on these investigations are listed in the reference section of the sampling plan. The EPA, through its contractors, Metcalf and Eddy, Inc.

conducted additional on-site soils investigations in June, 1985. A partial package of preliminary sampling results was forwarded to Hargis + Associates, Inc. in November, 1985.

Based on the results of these efforts, it has been determined that additional examinations of deep on-site soils beneath the location of a former on-site surface impoundment, further investigation of groundwater in the Bellflower aquitard, and investigation of groundwater in the Gage aquifer beneath the site are required.

In October, 1985, Montrose and the EPA entered into a consent order (U.S. EPA Docket No. 85-04). In entering into the consent order the objective of the EPA and Montrose is to obtain, through further investigation, information necessary for the performance of a feasibility study which will evaluate the remedial action alternatives which may be appropriate for implementation at the Montrose site.

HYDROGEOLOGIC CONDITIONS

The Montrose site is located in the western portion of the coastal plain in Los Angeles County, California. Principal hydrogeologic units in the area include the Bellflower aquitard, and the Gage, Lynwood, and Silverado aquifers (Hargis + Associates, Inc., 1985).

The top of the Bellflower aquitard occurs at a depth of between 63 and 70 feet beneath the site. The thickness of the unit beneath the Montrose site is unknown, but may be approximately 50 feet based on the driller's log of the nearby Jones Chemical company well (Table 1). Only the upper eight to ten feet of the Bellflower aquitard were penetrated by the five on-site monitor wells constructed by Montrose in April and May, 1985. The portion of the Bellflower aquitard penetrated by those wells consisted of clayey sand, sandy clay, and sand, and is overlain by unsaturated sand, sandy clay and clayey sand.

The Gage aquifer was not penetrated by the on-site monitor wells, but the top of the aquifer is thought to occur at a depth of approximately 120 feet based on the log of the Jones Chemical Company well (Table 1). The Gage aquifer consists of coarse sand with some sandy clay and is overlain by the Bellflower aquitard. The thickness of the Gage aquifer beneath the site is estimated to be approximately 53 feet (Table 1).

The Lynwood aquifer was not penetrated by the on-site monitor wells but the top of the aquifer is thought to occur at a depth of approximately 248 feet based on the log of the Jones Chemical Company well (Table 1). The Lynwood consists of coarse sand and gravel, and is overlain by a clay confining bed. The thickness of the Lynwood aquifer beneath the site is estimated to be approximately 35 feet.

The top of the Silverado aquifer is estimated to occur at a depth of about 486 feet beneath the site and consists of gravel overlain by an aquitard comprised of clay and indurated sands and gravels.

The shallow groundwater encountered in the existing monitor wells beneath the Montrose site occurs within the Bellflower aquitard. Groundwater occurs in the Bellflower aquitard at depths ranging from approximately 68.8 feet below land surface to 74.1 feet below land surface. The elevation of the water table beneath the site ranges from approximately -26.1 feet below MSL (Mean Sea Level, U.S.G.S. datum) to -25.4 feet below MSL. Groundwater elevations measured in the existing on-site monitor wells since April, 1985 have fluctuated.

Water level data from the Del Amo hazardous waste site, obtained from shallow wells completed in the Bellflower aquitard, ranged from -26 to -28 feet below MSL in 1984 (Dames and Moore, 1984). The Del Amo site is south and east of the Montrose site.

Based on the most recent on-site water level measurements, and the data from the Del Amo site, groundwater in the Bellflower aquitard generally



appears to be moving in a southeasterly direction. Presently available on-site data are insufficient to determine whether this groundwater is in hydraulic connection with groundwater that occurs in the Gage aquifer below the Bellflower aquitard at the Montrose site.

Recent water level data for the Gage aquifer are not available from any location in the immediate vicinity of the Montrose site. The Los Angeles County Flood Control District discontinued measuring Gage aquifer water levels in the vicinity of the Montrose site in 1978 (Hargis + Associates, Inc. 1985).

Water level elevations measured in the vicinity of the Del Amo hazardous waste site in 1978 indicate that groundwater in the Gage aquifer was moving in an easterly to southeasterly direction (Ecology and Environment, 1983). The current direction of groundwater movement in the Gage aquifer beneath the Montrose site is not precisely known, but may be in a southeasterly direction.

SAMPLING OBJECTIVES

The objective of this sampling plan is to further determine the extent of on-site soils and groundwater contamination which may have resulted from activities at the Montrose site and to gather data of sufficient quantity and quality to support the feasibility study. The quality of data will be assured by following sampling protocols described in the Quality Assurance Project Plan (QAPP). The quantity of data is specified in Appendix A of the consent order.

The sampling will be conducted in phases to allow evaluation of the analytical results and provide a basis for determining the number and location of additional sampling points, if necessary. Phase I sampling will consist of constructing four on-site monitor wells to be completed in the Bellflower aquitard, three on-site monitor wells to be completed in the Gage



aquifer, and additional soils borings in the vicinity of a former on-site impoundment. Water samples will be obtained from the wells and soil samples will be obtained from the soils borings for analysis. Up to four additional on-site Bellflower aquitard monitor wells and one additional Gage aquifer monitor well may be constructed during Phase I, if required, per the terms of Appendix A of the consent order.

TARGET CHEMICALS

Groundwater and soil samples collected during Phase I will be analyzed for the Target Chemicals. The Target Chemicals in the investigation, chosen in part by the EPA on the basis of its June, 1985 soils investigations are:

- DDT (all isomers, and DDD, DDE)
- BHC (all isomers)
- Monochlorobenzene
- Dichlorobenzene
- Benzene
- Chloroform
- Acetone

Although more extensive than required by the consent order, the above listed chemicals will be referred to in this plan as the Target Chemicals.

The groundwater samples will also be analyzed for common ions to aid in differentiating between groundwater from the Bellflower aquitard and the Gage aquifer. Computations of anion-cation balances will also provide additional quality control on the groundwater samples. Laboratory methods, handling and preservation procedures for groundwater samples are summarized in Table 2.



Extracts will be obtained from twenty-four of the soil samples collected to extend laboratory holding times. Only twenty-four of the samples will be analyzed as explained in the soil sampling procedures. Soil sample analytical methods, handling and preservation procedures are listed in Table 3.

Quality assurance and quality control procedures as presented in the On-Site Quality Assurance Project Plan (QAPP, Hargis + Associates, Inc., 1986) will be followed during Phase I activities to assure the accuracy, precision, completeness, representativeness and comparability of the data generated during the sampling efforts.

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GROUNDWATER SAMPLING

During the Phase I sampling program, four groundwater monitor wells completed in the Bellflower aquitard, and three monitor wells completed in the Gage aquifer will be constructed on the Montrose site. The monitor wells will be constructed to: aid in further evaluation of geologic conditions; further define the depth to groundwater and velocity of flow; further define the chemical quality of the groundwater in the Bellflower aquitard; define the chemical quality of the groundwater in the Gage aquifer. Although not required by the consent order, it is proposed that one exploration borehole be constructed first to develop additional geologic data which can be used to maximize the final design of the monitor wells and to minimize the possibility of cross-contamination between the Bellflower aquitard and the Gage aquifer during construction of the Phase I on-site wells.

EXPLORATION BOREHOLE

One exploration borehole for lithologic control will be drilled to the top of the Gage aquifer using fluid rotary methods. The exploration borehole will be drilled at the northwest corner of the site (Figure 2). Continuous detailed lithologic descriptions of materials encountered will be noted. The primary purpose of this borehole will be to determine the thickness of the Bellflower aquitard and establish additional geologic control. Possible modifications to monitor well construction design for the Bellflower aquitard wells as specified below may be necessary depending on the geologic information from the exploration borehole. The exploration borehole will also provide useful data for the final design of the Gage aquifer monitor wells. The exploration borehole will be abandoned by pressure cementing to land surface.



BELLFLOWER AQUITARD MONITOR WELLS

The proposed locations of the four new Bellflower aquitard monitor wells are shown on Figure 2 along with the existing five Bellflower aquitard wells MW-1 through MW-5. The new Bellflower aquitard monitor wells are located to further define the direction of groundwater flow and the distribution of contaminants in the Bellflower aquitard on-site. Monitor well BF-1 is intended as an upgradient control well. Monitor well BF-2 is located in an area of the site where no previous monitor wells have been drilled and with monitor wells BF-3 and BF-4 will aid in defining the eastern and southeastern distribution and potential direction of movement of the contaminants.

Monitor Well Construction

At the recommendation of the EPA, the Bellflower aquitard monitor wells will be drilled using the hollow stem auger drilling method with continuous coring for lithologic information from at least one borehole. While other methods of drilling may tend to better minimize the movement of potentially contaminated formation fluid into or out of the borehole, this may not be important in the Bellflower aquitard. Complete penetration of the Bellflower aquitard using bucket auger methods proved unsuccessful due to unstable borehole conditions and caving during previous drilling at the Montrose site. The EPA recommended method of hollow-stem auger drilling will hopefully overcome this difficulty.

Based on presently available data, and after discussion with EPA technical advisors, the Bellflower aquitard monitor wells are planned to be drilled to an approximate depth of 85 feet and will not fully penetrate the Bellflower aquitard. The bellflower aquitard monitor wells will therefore be similar in construction to the existing on-site monitor wells. Also, full penetration of the Bellflower aquitard could result in cross-contamination of the Gage aquifer. Geologic information obtained from the exploration borehole will aid in determining final well depth.

Approximately 65 feet of steel conductor casing will be installed and grouted into place. After sufficient time has elapsed to allow the cement to set, the borehole will be drilled and completed to the total depth. The wells will be cased with four-inch PVC casing. Below the water table approximately 15 feet of PVC well screen will be placed at the bottom of the borehole so construction will be similar to the existing monitor wells. Each well will be sand packed opposite the perforations. A bentonite seal extending above the bottom of the conductor casing will be placed on top of the sand pack (Figure 3). Concrete utility vaults with locking lids will be installed at the surface over each well. Vaults will be set a minimum of one inch above grade to minimize entry of surface water.

After the casing is installed each Bellflower aquitard monitor well will be developed by removing a minimum of three (3) casing volumes. Discharge rates will be estimated volumetrically. Recovery of the groundwater levels after development will be measured if water levels recover within a reasonable time.

Small capacity submersible pumps may be installed in each Bellflower aquitard monitor well. Discharge rates of the pumps and pump depth settings will be based on the discharge rates estimated during development. In the event that the yields of the wells are too low to warrant the use of permanent submersible pumps, the wells will be purged and sampled by bailing with a teflon or stainless steel bailer.

GAGE-AQUIFER MONITOR WELLS

The proposed locations of the Gage aquifer monitor wells are shown in Figure 2. The Gage aquifer monitor wells are located to provide broad areal coverage of the Montrose site. Based on the very limited available groundwater data, monitor well G-1 is located in the apparent upgradient direction from the former impoundment. Monitor wells G-2 and G-3 will



provide an indication of groundwater quality in directions generally downgradient of the former impoundment.

Monitor Well Construction

The Gage aquifer monitor wells will be drilled using the hydraulic rotary drilling method and the hollow stem auger method. The fluid rotary method of drilling has been selected to prevent the movement of any contaminants from the Bellflower aquitard to the Gage aquifer through the borehole during drilling. A nominal fifteen-inch borehole will be drilled to approximately 120 feet to the top of the Gage aquifer. Ten-inch steel casing will be installed and pressure grouted in place. Cement will be forced down the inside of the casing and up the annulus to land surface during the grouting process. After sufficient time has elapsed to allow the cement to set, the borehole will be advanced with hollow stem auger techniques to approximately 135 feet or until the Gage aquifer has been sufficiently penetrated. Four-inch schedule 40 PVC flush threaded casing will be installed with approximately 15 feet of PVC well screen placed at the bottom of the borehole. Based on a grain size analysis, each well will be sand packed to approximately 5 feet above the perforations and a bentonite seal will be placed on top of the gravel (Figure 4). Concrete utility vaults with locking lids will be installed at the surface of each well. Vaults will be set approximately one inch above grade to minimize the entry of surface water.

After the casing is installed, each Gage aquifer monitor well will be developed by removing at least three casings volumes of water. Discharge rates will be estimated volumetrically. Recovery of the groundwater levels after development will be measured if water levels do not recover too quickly to do so.

In each Gage aquifer monitor well permanently installed submersible pumps will be used to purge the wells and obtain water samples. Discharge



rates of the pumps will be based on discharge rates measured during development.

LITHOLOGIC LOGGING

During the drilling of the exploration boreholes, and the Bellflower aquitard and Gage aquifer monitor wells, detailed logs will be made in accordance with the QAPP. These logs will include, among other things, descriptions of the sediments encountered, grain size, shape, sorting, color, mineral composition, and degree of induration. Records of penetration rates, drilling fluid characteristics, casing schedules, and other observations will be recorded. All drilling and logging will be supervised by a registered geologist.

DISPOSAL OF DRILL CUTTINGS, DRILLING FLUIDS AND DEVELOPMENT WATER

All drill cuttings and drilling fluids produced during the monitor well construction will be containerized and stored on-site until chemical analyses can be performed and a determination made regarding the potential hazard of the material. See Appendix A, pages A-11 to A-13.

GROUNDWATER SAMPLING PROCEDURES

Groundwater samples will be collected from each monitor well in accordance with the procedures outlined in the QAPP. The wells will be pumped until they are totally evacuated or until a minimum of three casing volumes of fluid is removed from the wells. The Bellflower aquitard wells may have to be bailed if they will not produce a sufficient volume of water to warrant the use of a submersible pump. The temperature, pH, and specific electrical conductance (EC) of the well discharge will be continuously

measured to verify that these parameters have stabilized prior to collection of samples.

Sampling procedures will consist of the following:

1. Measure the water level with an electric sounder or tape to the nearest 0.01 foot.
2. Pump or bail until the well is dry or a minimum of three casing volumes have been removed.
3. Bail or pump and collect the groundwater samples in the appropriate sample containers (QAPP Section 5.3.1) from the discharge at the wellhead or from the bailer. Non-preserved sample containers will be rinsed with the well discharge prior to sample collection and properly labeled in the field. Pesticide and other preserved containers will not be pre-rinsed.
4. Record all pertinent data, including well location, sample number(s), time of sample collection, preservatives used, weather, etc., in a field notebook. Sign and date field notebook.

The following information will be collected and entered into a field notebook each time a well is sampled: 1) static depth to groundwater; 2) the time that pumping or bailing begins; 3) the time of sample collection; 4) the pump discharge rate or number of bails; 5) the field parameters pH, EC, and temperature; and 6) the time that pumping or bailing stops.

Further details on the groundwater sampling procedures are contained in the QAPP in Section 5.3.1 on pages 16-19 and Section 5.4.1, pages 22-23.



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Frequency of Sampling

An initial water sample will be collected from each monitor well after installation of the pumps. A second water sample will be collected approximately two weeks after the initial sample. After reviewing the initial results additional samples may be collected. The frequency of sample collection will depend on the results of chemical analyses of the first two samples.

Field Measurements and Equipment Requirements

Field measurements collected during the sampling activities will include water level measurements, discharge rates, electrical conductivity, temperature, and pH. A conventional pH meter with a combination gel filled electrode will be used for field measurements. A combination conductivity-temperature-salinity meter will be used to measure the electrical conductivity. Temperature measurements will be obtained with a field thermometer and the result verified with a conductivity meter. The instruments will be calibrated periodically to ensure accuracy and the probes thoroughly rinsed with distilled water before each measurement. All field measurements will be recorded in a field notebook.

Sample Containers

Water samples for analysis of common ions will be collected in one-liter polyethylene bottles. The bottles will be thoroughly rinsed with water bailed or pumped from the monitor well prior to sample collection. Temperature and electrical conductance will be measured in the field at the time of the sampling in a separate, thoroughly rinsed container utilizing a separate portion of sample water which will not be submitted for analysis.

Water samples for analysis of the volatile organic compounds will be collected in 40 ml glass vials with teflon-lined threaded caps. All vials will be completely filled with water. The teflon liner is placed on the



vial in such a manner as to expel any residual air. All water sample containers will be taped, labeled and placed in an ice chest on ice until the analyses are performed.

Water samples for analysis of DDT and its metabolites will be collected in one-liter amber colored glass bottles sealed with teflon-lined caps. All water sample containers will be taped, labeled, and placed in ice chests on ice until the analyses are performed.

See QAPP Section 5.4.1, for details on sample container preparation.

Split Samples for EPA

Provisions for split samples from the monitoring wells will be made. EPA, its contractors and the Regional Water Quality Control Board will be notified at least 20 days prior to commencement of field sampling to allow mobilization of their sampling team and selection of a laboratory. Split sample containers will be supplied by EPA or its contractors. Close coordination with EPA and its contractors will be maintained throughout the groundwater sampling process.

SOIL SAMPLING

Approximately 240 lineal feet of additional soil borings will be conducted in the vicinity of the former wastewater impoundment area. Approximately 48 samples will be obtained from an array of four soil borings as shown on Figure 5. The array, designed as suggested by the EPA and its contractors, is intended to provide information on the horizontal and vertical distribution of contaminants in the soil underlying the immediate vicinity of the former impoundment area.

Soil sampling data from soil boring S-101 and monitor well MW-2 partially define deep soil conditions below and immediately adjacent to the former impoundment. Four additional 60-foot borings northeast, east, and southeast of the former impoundment at varying distances from the center of the former impoundment are proposed.

Soil samples will be collected at five foot intervals beginning at the 20 foot level using split-tube samplers with brass liners driven into the formation. Extracts from the samples obtained at ten-foot intervals from all boreholes (20, 30, 40, 50, 60 feet) will be analyzed immediately for the Target Chemicals.

Additionally, extracts from the 25 and 35 foot interval from both S-201 and S-202 will be analyzed for the Target Chemicals. These last four sample intervals may be altered in the field at the geologists discretion using soil coloration, staining, moisture content and odor as guidelines.

SOIL SAMPLE COLLECTION PROCEDURES

Soil sampling procedure will adhere to the methodologies outlined in the QAPP. See QAPP, Section 5.3.2, pages 19-22 and Section 5.4.2, page 24. A bucket auger rig will be employed to advance the soil borings and collect



the sample. Each split-tube sampler will be assembled just prior to the sampling run. Three six-inch brass tubes that have been thoroughly cleaned with TSP detergent and distilled water will be placed in the sampler body. The sampler will then be assembled and attached to the kelly bar of the drill rig for collection of the sample. After the tube is retrieved, the middle brass tube containing the sample will be carefully removed from the sampler. An organic vapor analyzer (OVA) will be used to monitor potential concentrations of volatile organic compounds in samples not packaged for analysis. Teflon sheets will be placed over the ends of the tube and held in place with plastic end caps secured with electricians tape. Each sample will be labeled with the hole number, depth interval, and date and placed in individual plastic bags in an ice chest. The top and bottom of the sample will be noted on the sample tube.

The following information will be entered into a field notebook each time a soil sample is collected: 1) hole location and number; 2) depth interval; 3) time of sample collection; 4) OVA reading; 5) any other pertinent observations.

The drill rig and split-spoon sampler(s) will be steam cleaned between borings.

Further details on the collection and handling of soil samples are contained in the QAPP, Section 5.3.2, pages 19-22 and Section 5.4.2, page 24.

LITHOLOGIC LOGGING

During the drilling of the soil borings detailed logs of each boring will be made in accordance with the QAPP, Section 5.3.2, page 20. These logs will include descriptions of the sediments encountered, grain size, shape, sorting, color, mineral composition, moisture content, and degree of induration. All logging will be supervised by a registered geologist.



DISPOSAL OF DRILL CUTTINGS

All drill cuttings produced during the soil boring will be immediately backfilled into the borings to a depth of ten feet and a cement plug equal to the thickness of the asphalt cap plus ten feet will be used to restore grade and prevent infiltration should the asphalt cap be removed. Any remaining cuttings will be containerized in 55-gallon covered steel drums on-site until analytical results are available. See Appendix A, pages A-11, A-13 for information regarding the ultimate disposal of cuttings.

SPLIT SAMPLES FOR EPA

Split soil samples will be provided to the EPA in the field or at the laboratory. Since true splits of soil samples are not possible, adjoining brass tubes from the split-tube sampler will be provided. These samples should be handled, preserved and stored in a manner identical to the primary sample. Close coordination with EPA and its contractors will be maintained throughout the sampling process.

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QUALITY ASSURANCE

A Quality Assurance Project Plan (QAPP) has been prepared for the on-site sampling program and appears under separate cover (Hargis + Associates, Inc., 1986). Additional details on quality assurance/quality control aspects for the sampling activities are presented below and include: field measurements and calibration of instruments; sampling techniques; preservation procedures; sample integrity documentation (blanks, splits, and duplicates); chain-of-custody records; and packaging, shipping and handling procedures.

FIELD MEASUREMENTS AND CALIBRATION OF EQUIPMENT

Field equipment used to perform various measurements during this investigation will include a steel tape and sounder for measuring water levels, a YSI Model 33 conductivity meter for measuring electrical conductivity of water samples, a Corning Model 103 pH meter for measuring pH, and a field thermometer.

All water levels will be measured with a calibrated two-conductor sounder or steel tape. The sounder will be calibrated with the steel tape prior to beginning field measurements. The steel tape will be inspected for breaks or bends. Both the sounder and steel tape will be rinsed in distilled water before each measurement. Different sets of dedicated sounders and tapes will be used for the Gage and Bellflower monitor wells.

The probes on the conductivity meter and pH meter will be rinsed in distilled water prior to use. The pH meter will be calibrated before measurements at the next sampling station in a standard solution prior to use. The water sample for which pH and electrical conductivity were determined will not be used to fill sample containers. All manufacturer's instructions for use of the instruments will be followed.



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SAMPLING TECHNIQUES

The soil and water sampling techniques to be used in this investigation are documented in separate sections of this sampling plan and the accompanying QAPP, Sections 5.3.1, 5.3.2, 5.4.1, 5.4.2, pages 16-24.

SAMPLE PRESERVATION

All soil and water samples will be stored in ice chests, packed in ice and transported to the laboratory within 24 hours of collection. The ice chests will be sealed with tape. Transmittal letters, chain-of-custody documents, and lab schedules will be sealed in two zip-lock bags inside the ice chests.

SAMPLE INTEGRITY

Each shipment of water samples will contain a blank water sample of certified organic-free water. The blank will be collected in a 40 ml vial, sealed, labeled, packed and stored in a manner identical to the other water samples collected. The identity of the blank water sample will not be known to the laboratory performing the analysis.

Duplicate water samples for analysis of volatile organic compounds, pesticides, and anion/cation analysis will be included in each sampling round. The duplicates will be collected, sealed, labeled, packed and stored in a manner identical to the other water samples collected. Duplicate samples will comprise at least ten percent of the samples sent to the laboratory, or at least one duplicate per sampling day. The identity of the duplicate water samples will not be known to the laboratory performing the analysis. Each shipping container which has volatile organic samples will also contain a blank of certified organic free water.



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Each shipment of soil samples will contain a soil sample consisting of soil from a remote location. The blank soil sample will be collected, sealed, labeled, packed and stored in a manner identical to the other soil samples collected. The identity of the background soil samples will not be known to the laboratory performing the analysis.

Duplicate soil samples consisting of adjacent brass tubes will be collected for approximately 10 percent of the soil samples.

SAMPLE HANDLING, PACKAGING, SHIPMENT AND CHAIN-OF-CUSTODY

Each water and soil sample will be labeled in the field with the well or boring number, date and time of sampling, collector's name and company, and the analyses to be performed. Sample container lids will be secured with electrician's tape. All pertinent data concerning each sample will be recorded in a field log book. The sample will be immediately placed in an ice chest on ice and remain in the custody of the sample collector until transport to the laboratory. Letters of transmittal, chain-of-custody documentation, and laboratory schedules for analyses to be performed will be prepared at the end of each sampling event, and sealed inside each shipment to the laboratory. Water and soil samples will be transported to the laboratory by vehicle at the end of each sampling day. Brown and Caldwell Analytical Services Division is presently planned to be used for analyses of all samples.



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TABLE 1

DRILLER'S LOG OF JONES
CHEMICAL COMPANY WELL

<u>From</u>	<u>To</u>	<u>Classification of Materials</u>
Upper Pleistocene Deposits		
0	3	Black adobe
3	32	Clay yellow
32	53	Cemented shells
53	71	Sand dry
71	102	Clay yellow
102	121	Clay blue
		"200-foot sand" from 121 to 174 feet
121	126	Coarse sand, dirty yellow
126	137	Clay blue sandy
137	161	Coarse sand, dirty yellow
161	174	Coarse sand, dirty blue
San Pedro Formation		
174	187	Sea mud
187	248	Clay blue
		"400-foot gravel" from 248 to 282 feet
248	262	Coarse sand blue
262	271	Sand and gravel 1/16"
271	282	Sand and gravel 1/8"
282	398	Clay blue
398	413	Cemented sand
413	458	Gravelly clay
458	486	Cemented gravel
Silverado Zone from 486 to over 727 feet		
486	519	Gravel tight dirty 1"
519	560	Gravel loose 1/2"
560	599	Clay blue
599	650	Gravel 1"
650	714	Gravel 3/4"
714	727	Clay blue sand

Source: Los Angeles County Flood Control District

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TABLE 2
WATER SAMPLE HANDLING, PRESERVATION, AND ANALYSIS

<u>Type of Analysis</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Analytical Methods</u>
Monochlorobenzene dichlorobenzene benzene chloroform acetone	40-ml glass vials with teflon-lined threaded caps	Refrigerate to 4 degrees C	EPA Method 624
Total DDT (all isomers) Total BHC (all isomers)	1-liter amber glass with teflon-lined threaded caps	Refrigerate to 4 degrees C	EPA Method 608

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TABLE 3
SOIL SAMPLE HANDLING, PRESERVATION, AND ANALYSIS

<u>Type of Analysis</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Analytical Methods</u>
Monochlorobenzene dichlorobenzene benzene chloroform acetone	Sealed brass tube sleeve with teflon- lined end caps	Refrigerate to 4 degrees C	EPA Method 8240
Total DDT (all isomers) BHC (all isomers)	Sealed brass tube sleeve with teflon- lined end caps	Refrigerate to 4 degrees C	EPA Method 8080

CHART 1501

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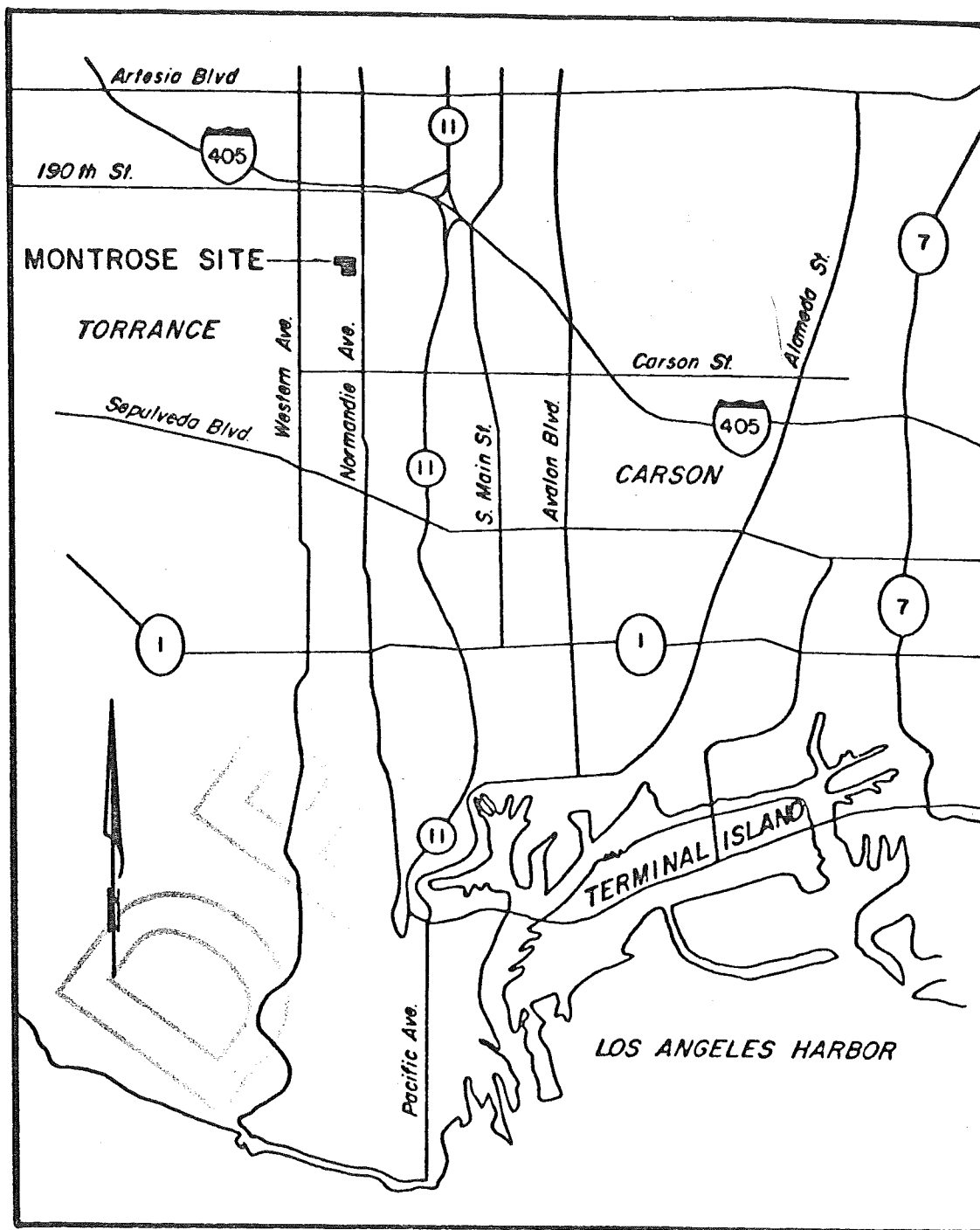
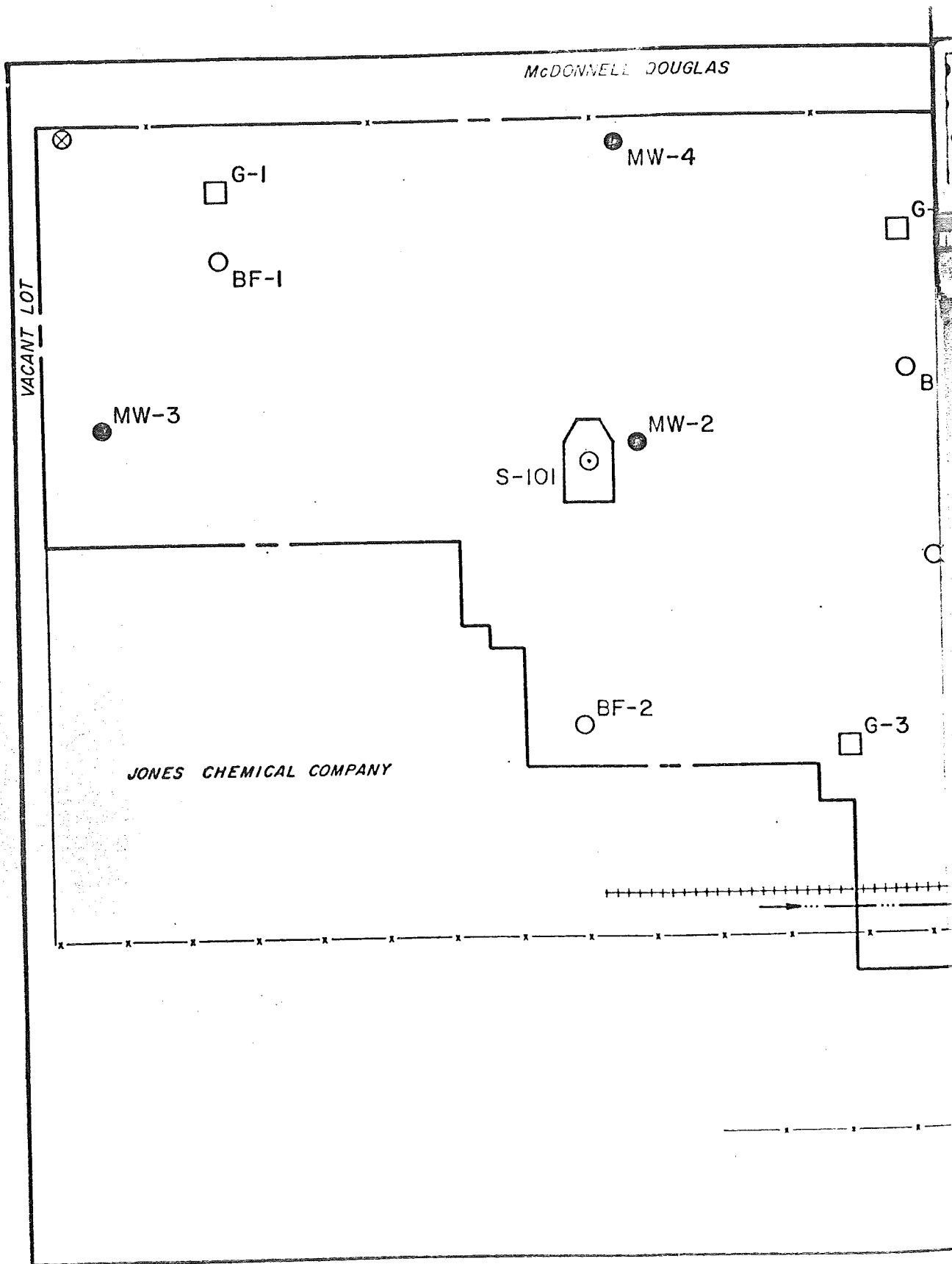
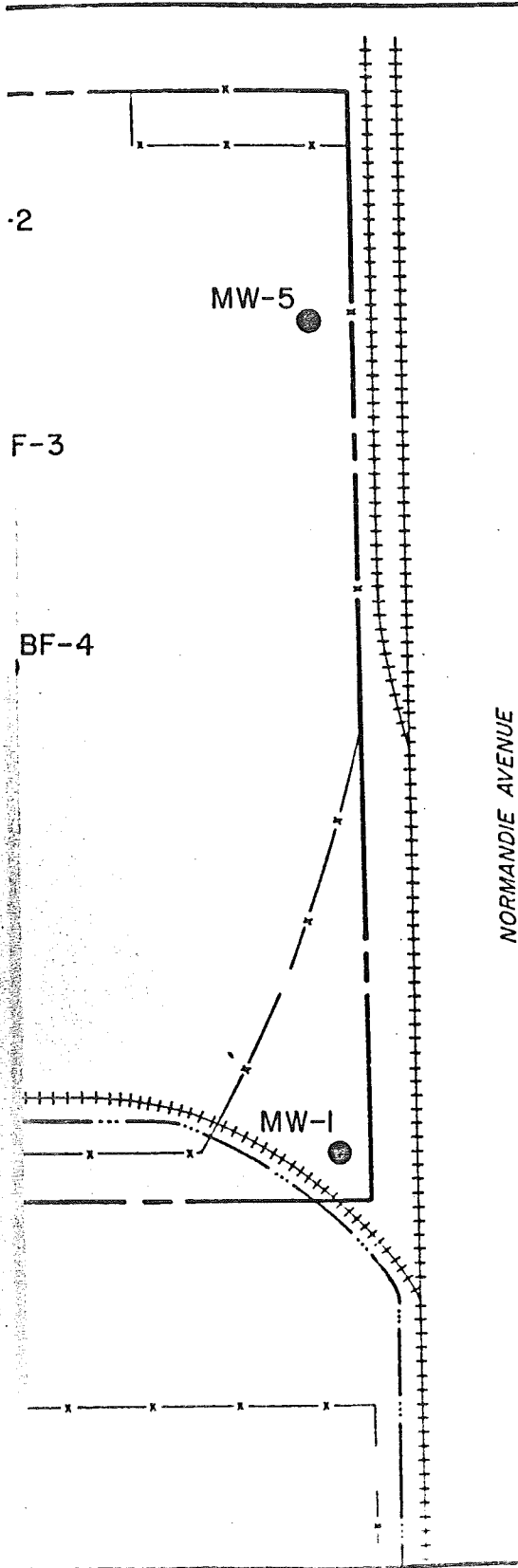


FIGURE I. LOCATION OF MONTROSE SITE

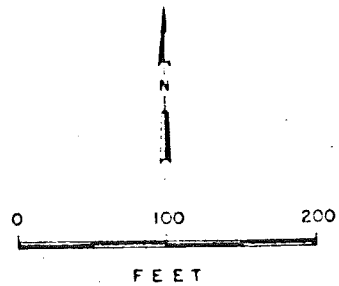


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EXPLANATION

- ⊗ PROPOSED EXPLORATION BOREHOLE
- PROPOSED BELLFLOWER MONITOR WELL
- PROPOSED GAGE MONITOR WELL
- ⊙ PREVIOUS SOIL BORING
- EXISTING BELLFLOWER MONITOR WELL
- ◡ FORMER WASTEWATER IMPOUNDMENT AREA
- x— FENCE
- DRAINAGE DITCH
- ++++ RAILROAD TRACK



MONTROSE CHEMICAL CORPORATION
TORRANCE, CALIFORNIA

LOCATION OF MONITOR WELLS

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology 2/86
San Diego, California

FIGURE 1

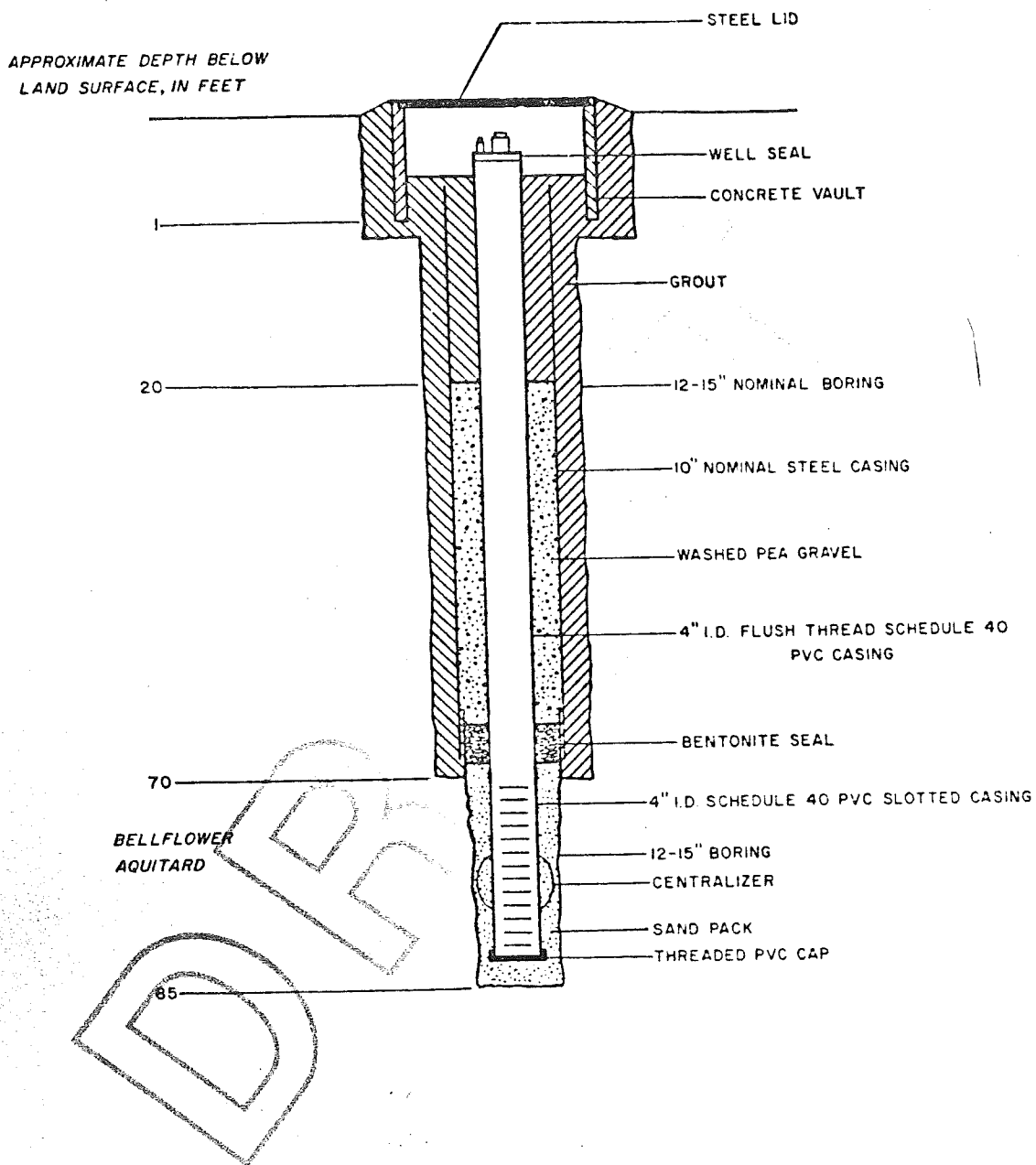


FIGURE 3. BELLFLOWER AQUITARD MONITOR WELL
CONSTRUCTION DIAGRAM

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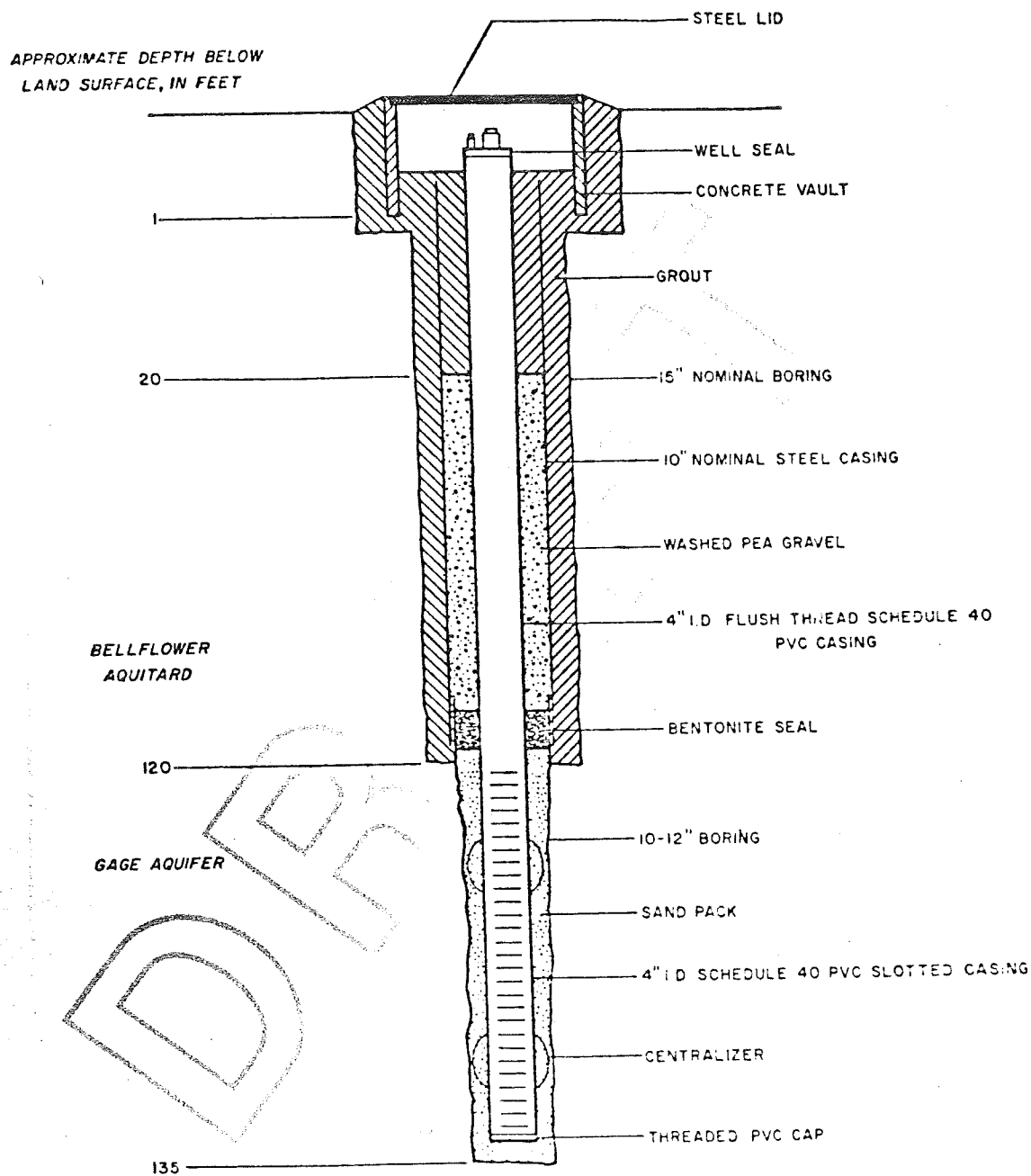


FIGURE 4. GAGE MONITOR WELL CONSTRUCTION DIAGRAM

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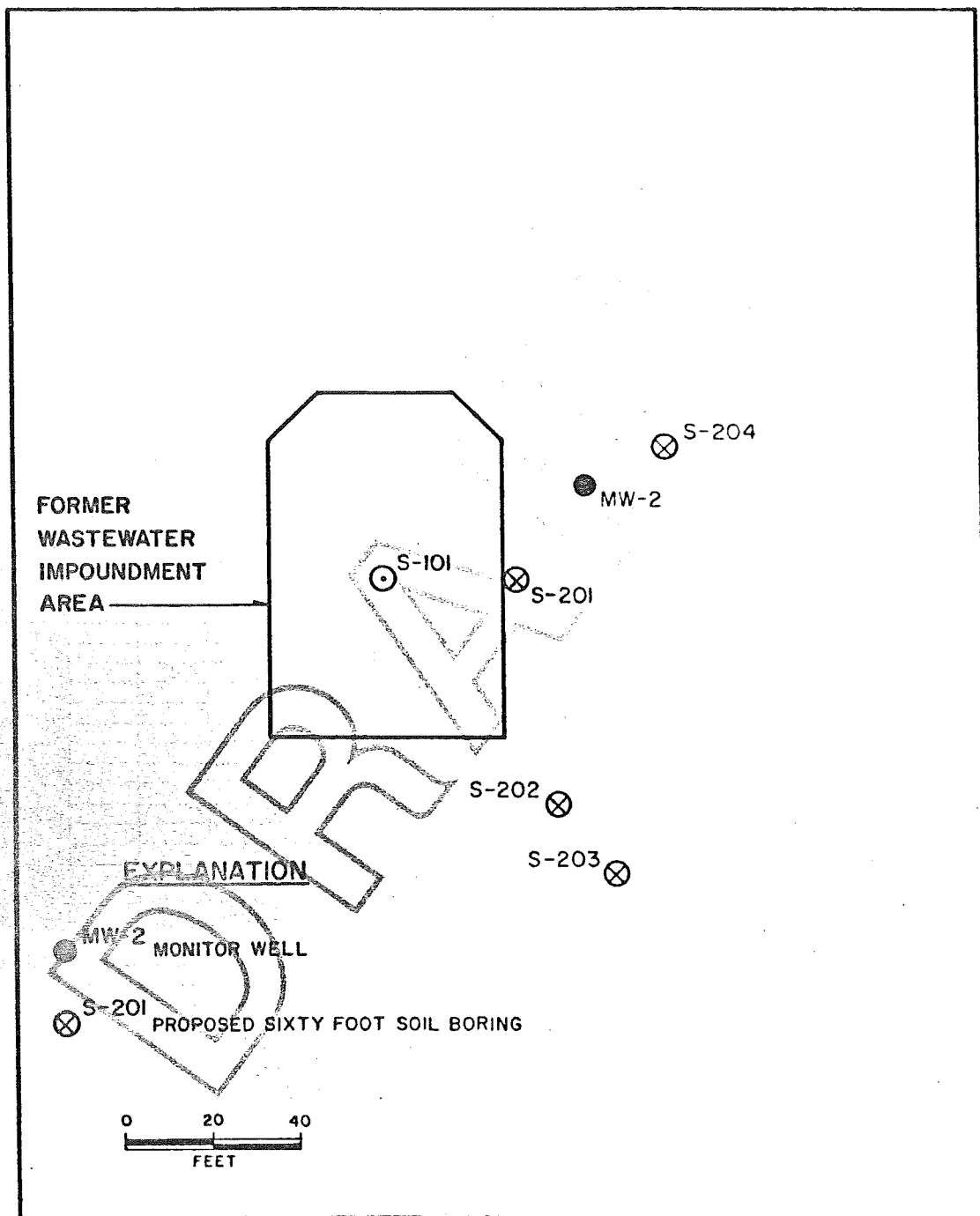
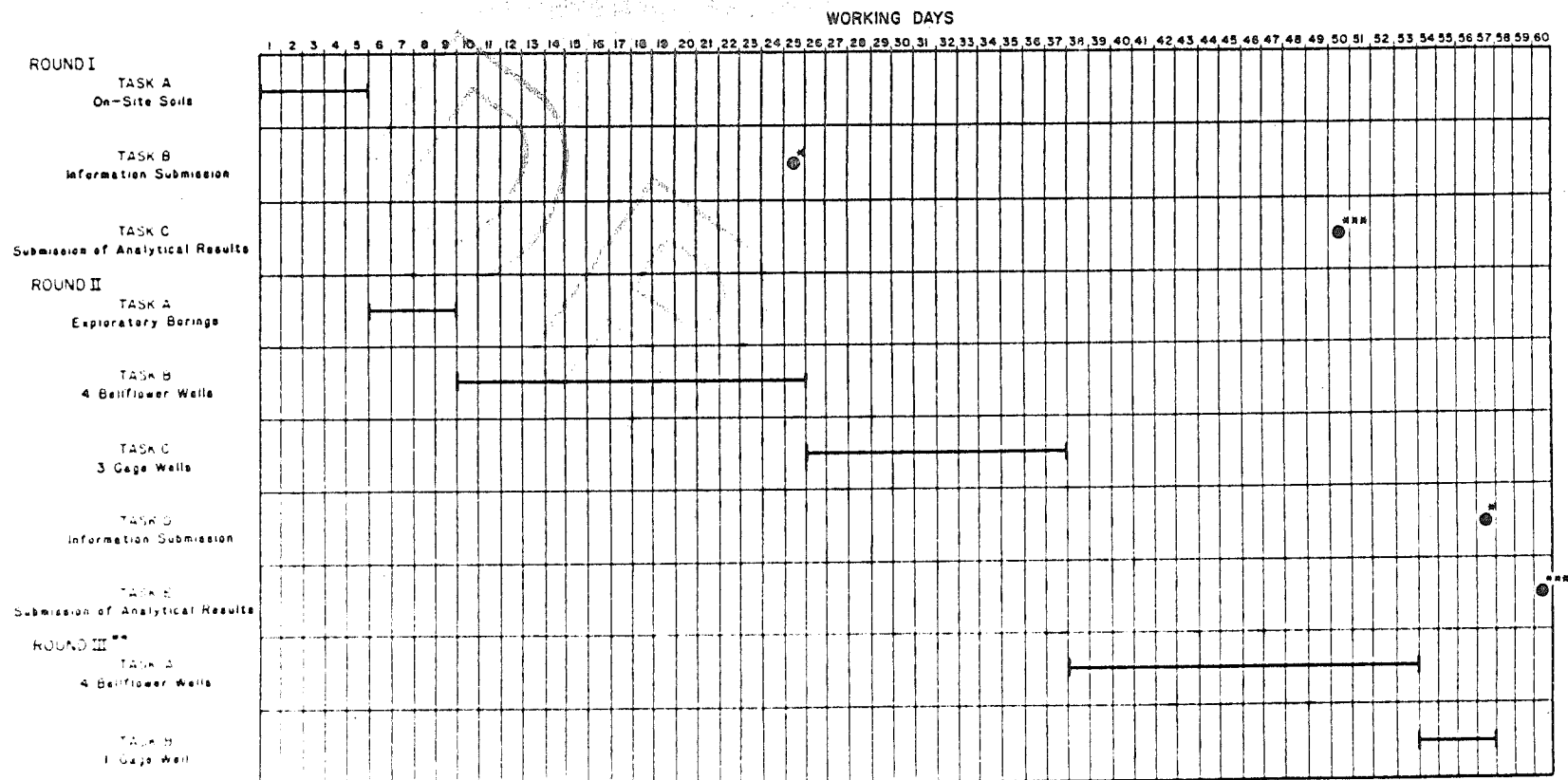


FIGURE 5. PROPOSED SOIL BORING LOCATIONS



- Must be within 20 calendar days of completion of sampling round
- ** Contingent on results of Round II and provisions of Appendix A
- *** 15 Calendar days after receipt, maximum of 45 days after sampling round

FIGURE 6. PROJECTED SCHEDULE OF FIELDWORK

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APPENDIX A

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APPENDIX A

HEALTH AND SAFETY PLAN

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APPENDIX A
HEALTH AND SAFETY PLAN
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APPENDIX A
HEALTH AND SAFETY PLAN

INTRODUCTION

This Health and Safety Plan (HSP) has been prepared for the on-site sampling program for the Montrose Chemical Corporation in Torrance, California. Protecting the health and safety of the investigative team, as well as the general public, is a major concern in hazardous waste site remedial investigations. Adherence to the program outlined in this document will reduce the risk of exposure to hazards that may be associated with on-site field activities.

This Health and Safety Plan addresses on-site sampling activities and target chemicals selected by EPA based on the results of previous investigations.

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SITE DESCRIPTION AND HISTORY

The Montrose site occupies about 13 acres in Torrance, California. The site is bounded by a railroad right-of-way and Normandie Avenue on the east, Jones Chemical Company on the south, a vacant lot on the west, and the McDonnell-Douglas facility on the north. The surrounding area consists of mixed residential, commercial, and industrial facilities.

Montrose Chemical Corporation manufactured DDT at the Torrance facility from 1947 to 1982. The facility was closed in 1982 and the site subsequently cleared and paved. Previous investigations addressing the potential for contamination at the Montrose site include on and off-site sampling of soils, groundwater, sediment and surface water by the U. S. EPA, its contractors, the California Department of Health Services, the Regional Water Quality Control Board, and Hargis + Associates, Inc., acting on behalf of Montrose.

In October, 1985 a consent order between the EPA and Montrose was finalized. Tasks, outlined in the EPA Remedial Investigation/Feasibility Study Final Workplan, Montrose Facility Site (Torrance, California), Metcalf and Eddy, Inc., October 1984 as modified by Appendix A of the consent order, are designed to obtain information necessary for the performance of a feasibility study. These tasks include off-site soil, sediment, and surface water sampling, on-site soil sampling and groundwater monitoring of the Bellflower aquitard and Gage aquifer.

The objective of the on-site sampling program is to further determine the extent of soil and groundwater contamination which may have resulted from activities at the Montrose site. The on-site work covered by this HSP will consist of the construction of seven monitoring wells and additional soil borings. Groundwater and soil samples will be collected from wells and borings respectively. Proposed sampling locations are shown on Figures 2 and 5.



SITE SAFETY PLAN

- This Site Safety Plan shall be made available to all personnel and posted during the investigation.
- All personnel shall be familiar with standard operating safety procedures and any additional instructions and information contained in the Site Safety Plan.
- All personnel shall adhere to the information contained in the Site Safety Plan.
- No personnel are allowed on-site alone; a minimum of two persons will always be present.
- All modifications to the Site Safety Plan shall be authorized by the Safety Officer, clearly marked on the posted plan, and explained to all team members.

SAFETY TEAM

The Hargis Associates, Inc. Safety Coordinator shall designate a Site Safety Officer. The Site Safety Officer shall accompany the investigative team and is responsible for implementing the Site Safety Plan. The Safety Officer reports directly to the Project Manager and shall be experienced in field operations and familiar with the use of air monitoring instrumentation, personal protection equipment, and decontamination procedures. Drilling contractors shall be required to comply with all local, state, and federal regulations in worker protection and shall be experienced in hazardous site investigative work.



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PROJECT TEAM

<u>Team Member</u>	<u>Responsibility</u>	<u>Telephone</u>
Dinah H. Jasensky	Safety Coordinator	(602) 881-7300
Matt Wiedlin	Safety Officer	(619) 454-0165
Ed Nemecek	Project Manager	(619) 454-0165
Roger Niemeyer	Hydrogeologist	(619) 454-0165

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HAZARD EVALUATION

This hazard evaluation is directed toward those waste materials which, based on data gathered to date, are known to be or may be present at on-site sampling locations: acetone, benzene, BHC, chloroform, dichlorobenzene, DDT, and monochlorobenzene. Toxicological data for these compounds are summarized in Table A-1, in addition to concentrations measured on-site and off-site during previous investigations.

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MONITORING REQUIREMENTS

The monitoring requirements for the on-site sampling program are based on the hazard evaluation. Monitoring requirements outlined in this section include personnel medical surveillance and environmental monitoring during investigative operations.

PERSONNEL MEDICAL SURVEILLANCE

The Hargis + Associates, Inc. investigative team will undergo initial medical screening by a licensed occupational physician to ensure that workers are in good health and have no medical conditions that might put them at an increased risk from this work. Periodic medical examinations will be conducted for all field personnel as part of the Hargis + Associates, Inc. safety program.

Initial screening and periodic exams shall be based upon toxicological data presented in Table A-1, Hazard Assessment. Examinations include a routine physical, medical history, serum chemistry tests, spirometer tests, and audiometry tests.

ENVIRONMENTAL MONITORING

Field operations during drilling, monitor well construction and sampling will be monitored by an organic vapor analyzer (OVA). Background levels in air shall be established with the OVA in areas well away from the influence of possible chemical releases from sampling activities or from diesel exhaust pipes. Readings exceeding 10 ppm above background will be cause to terminate operations until such time as appropriate safety measures have been taken. The Site Safety Officer shall be responsible for inter-



preting monitoring data and upgrading or downgrading the level of protection during sampling activities.

LEVELS OF PROTECTION

Levels of protection are determined by the Hazard Assessment (Table A-1) and may be modified as a result of environmental monitoring. Protection Level C, air purifying respirator, protective clothing, hardhats, gloves and boots will be provided for sampling operations.

During previous investigations, maximum concentrations of target chemicals in soil and groundwater were less than their respective permissible exposure limits (PELs) in air with the exception of monochlorobenzene and chloroform. Monochlorobenzene exceeded the PEL (75 ppm) at 180 ppm in a sample collected from monitor well MW-2 on July 2, 1985, and chloroform exceeded the PEL (10 ppm) at 24 ppm in a sample collected from monitor well MW-5 on April 26, 1985.

It is unlikely that airborne concentrations of monochlorobenzene and chloroform will equal concentrations previously found in soils or groundwater or exceed PEL concentrations as a result of volatilization during sampling activities. However, respiratory protection against exposure to these as well as other target chemicals will be provided during all field operations.

Air purifying respirators with organic vapor cartridges and pesticide prefilters will provide protection against likely concentrations of airborne target chemicals. Concentrations of chloroform above 10 ppm in air, however, would mandate more stringent respiratory protective measures. To protect the investigative team against possible exposure to high concentrations of chloroform or other contaminants, environmental monitoring will be conducted during sampling operations. OVA readings above 10 ppm will be evaluated by the safety officer and measures will be taken to provide



appropriate respiratory protection if necessary. These measures will include consideration of the use of ventilation blowers adjacent to sampling activities or supplied-air respirators.

Protective equipment that will be provided for sampling activities is listed below.

EQUIPMENT

Respiratory

North #7700-30 half-mask respirator
North #7500-3 organic vapor/acid gas cartridges
North #7500-23 pesticide pre-filters and filter covers
NIOSH/OSHA-approved supplied-air respirator - to be obtained as necessary

Visual

Uvex #9300 dust & chemical goggles

Hearing

Moldex pura-foam ear plugs

Protective Clothing

AF-18 Pioneer lined nitrile gloves
Disposable latex gloves
Poly coated tyvek coveralls, hoods,
and boots

Miscellaneous

16 unit first aid kit
SBS barrier cream
Hard hats with face shields if preferable to goggles
Ventilation blower - to be obtained as necessary



DECONTAMINATION AND DISPOSAL

Decontamination of Personnel and Equipment

Personnel decontamination shall be required prior to all breaks, meals, and at the end of the day. A decontamination station will be established at each sampling area (Figure 2). Disposable protective clothing, gloves and used chemical respirator cartridges shall be removed and disposed of in this area. Decontamination of individuals shall be accomplished by soap and water washing followed by a clean rinse at the decontamination station.

Non-disposable protective equipment, such as respirator face masks, sampling tools and other equipment, shall be decontaminated by scrubbing with detergent-water, using a soft-bristled brush followed by a clean water rinse. Clean respirator face masks shall be immediately stored in clean ziplock plastic bags.

Drill rigs and augers will be steam cleaned before initial use, after each borehole, and after final field operations.

Disposal of Investigation-derived Material

Soil cuttings resulting from soil boring activity will be immediately replaced in the borehole and the grade shall be restored with inert material and a cement cap at least as thick as the asphalt cap. Materials from drilling operations and decontamination operations shall be immediately placed in a container for temporary storage at the Montrose site. The container shall be labeled and stored in a location acceptable to Montrose for the period of analysis of the samples sent to the laboratory. Disposal of the wastes will be the responsibility of Montrose Chemical Corporation.

If wastes derived from investigation activities are determined by laboratory analysis to be hazardous, then disposal of those wastes will be conducted in compliance with EPA's interim policy "Procedure for Planning



and Implementing Off-site Response Actions" (Federal Register Vol. 50 No. 214, Tuesday, November 5, 1985), as follows:

Treatment

Treatment, reuse, or recycling of hazardous wastes shall be considered in the removal of investigation-derived hazardous materials. Removal alternatives should not be selected on cost alone, but should consider long-term effectiveness and long- and short-term costs as compared to disposal.

Selection of Off-site Treatment or Disposal Facility

Selection of an appropriate facility for off-site management of investigation-derived hazardous wastes shall meet the following requirements:

1. The owner or operator of any hazardous waste management facility under consideration must have a RCRA permit applicable to specific wastes and specific storage, treatment, or disposal processes.
2. A RCRA compliance inspection must be performed at the off-site facility to receive investigation-derived hazardous wastes not more than six months before receiving such wastes.
3. Any land disposal facility receiving investigation-derived hazardous wastes must meet RCRA minimum technical requirements per the Hazardous and Solid Waste Amendments of 1984. These technical requirements include groundwater monitoring and liner and leachate collection system standards.



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Manifest Requirements

Investigation-derived hazardous material transported to an off-site storage, treatment, or disposal site shall be accompanied by a Uniform Hazardous Waste Manifest, in compliance with requirements in 40 CFR 262.

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WORK LIMITATIONS

PERSONAL PRECAUTIONS

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated contaminated.
- Hands and face must be thoroughly washed upon leaving the work area.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- No facial hair which interferes with a satisfactory fit of the mask-to-face seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces; kneel on ground; or lean, sit, or place equipment on drums, containers, or the ground.
- Medicine and alcohol can magnify the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel unless specifically approved by a qualified physician.

SITE ACCESS

- Personnel and equipment in the contaminated area shall be minimized, consistent with effective site operations.
- Work areas for drilling and sampling activities are shown on Figure 2.



EMERGENCY PROCEDURES

In the Event of Personal Exposure

- Call the Safety Officer to the scene immediately.
- Immediately remove any clothing that becomes contaminated. Promptly wash with soap and flush with clean water.
- Determine the material involved.
- Don't expose self or others to the materials unnecessarily. Stay upwind, control access to the area, and wear the appropriate protective equipment.
- Remove people from the contaminated area. Wear the appropriate protective equipment and don't charge in blindly. Administer first aid, if necessary.
- If the incident warrants, the Safety Officer must call the appropriate emergency services. See the list of emergency phone numbers in the next section. The emergency care facility is indicated on Figure A-1.
- Record information on the exposure.

In the Event of Personal Injury

- Call the Safety Officer to the scene immediately.
- Remove people from dangerous area or equipment.
- Administer first aid, if necessary.
- If the incident warrants, the Safety Officer must call the appropriate emergency services. See the list of emergency phone numbers in the next section.

In the Event of Fire or Explosion

- Evacuate personnel from area of danger.
- Call Safety Officer to the scene.



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- Administer first aid if necessary.
- The Safety Officer shall:
 - notify the Fire Department.
 - contact the local hospital immediately when a major fire starts, advising them of the chemicals involved and the Poison Control Center to be contacted.
 - Call the Montrose emergency coordinator.
 - Keep personnel out of the smoke or mist created by the fire and hose streams. Immediately evacuate areas in the path of smoke.
- See emergency phone numbers in following section.

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EMERGENCY SERVICES

Ambulance: 328-3131 (paramedics)

Hospital Emergency Room: Harbor-UCLA Medical Center
1000 West Carson
Torrance, California
533-2383

Poison Control Center: Los Angeles County Medical Association
484-5151

Police: 3300 Civic Center Drive
Torrance, California
320-2611

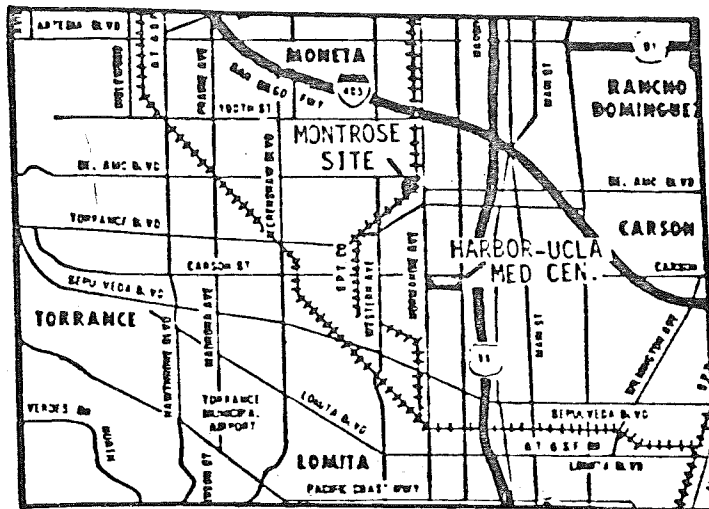
Fire Department: 1701 Crenshaw Boulevard
Torrance, California
328-3131

Airport: Torrance, California
325-0191

Explosives Unit: N/A

Client Contact: (213) 323-2056 (John Kallok)

The location of the emergency care facility is shown on Figure A-1.



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FIGURE A-1. LOCATION OF EMERGENCY FACILITY

TABLE A-1

HAZARD ASSESSMENT

CONTAMINANT	ACETONE	BENZENE
MEASURED CONCENTRATION MEDIA	Groundwater ³	Groundwater ³ (ug/l)
MIN. VAL.	None detected	-5
MAX. VAL.	None detected	3200
EXPOSURE ROUTE	Inhalation, ingestion, contact	Inhalation, absorption, ingestion, contact
HAZARD PROPERTY	Irritant, toxic	Irritant, toxic, carcinogen
HAZARD SPECIFICATIONS		
17 PEL ¹	750 ppm	10 ppm
IDLN ²	20,000 ppm	2,000 ppm
TOXIC EFFECTS	Irritating to eyes, nose, throat; headache; dizziness; dermatitis	ACUTE: irritating to eyes, nose, respiratory system; head- ache, dizziness, nausea; CHRONIC: bone marrow depression and aplasia; rarely, leukemia
SYNERGISTIC EFFECTS	Unknown	Unknown
TARGET ORGANS	Respiratory system, skin	Blood, CNS, skin, bone marrow, eyes, respiratory system

1. PEL = Maximum permitted 8-hr. time-weighted average concentration of an airborne contaminant (29 C.F.R. 1910.1000)
2. IDLM = The "Immediately Dangerous to Life or Health" concentration
3. Samples collected from on-site monitor wells, April, May, July, 1985

ug/l = micrograms per liter; ppm = parts per million
 (-) = less than; numerical value is the limit of detection for that compound in that medium.

References: California Administrative Code, Title 8, Section 5155
 Patty's Industrial Hygiene & Toxicology, 3rd Edition, 1981
 NIOSH/OSHA Pocket Guide to Chemical Hazards, 1980

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TABLE A-1

HAZARD ASSESSMENT

CONTAMINANT	ACETONE	BENZENE
MEASURED CONCENTRATION MEDIA	Groundwater ³	Groundwater ³ (ug/l)
MIN. VAL.	None detected	-5
MAX. VAL.	None detected	3200
EXPOSURE ROUTE	Inhalation, ingestion, contact	Inhalation, absorption, ingestion, contact
HAZARD PROPERTY	Irritant, toxic	Irritant, toxic, carcinogen
HAZARD SPECIFICATIONS		
17 PEL	750 ppm	10 ppm
IDLH ²	20,000 ppm	2,000 ppm
TOXIC EFFECTS	Irritating to eyes, nose, throat; headache; dizziness; dermatitis	ACUTE: irritating to eyes, nose, respiratory system; head- ache, dizziness, nausea; CHRONIC: bone marrow depression and aplasia; rarely, leukemia
SYNERGISTIC EFFECTS	Unknown	Unknown
TARGET ORGANS	Respiratory system, skin	Blood, CNS, skin, bone marrow, eyes, respiratory system

1. PEL = Maximum permitted 8-hr. time-weighted average concentration of an airborne contaminant (29 C.F.R. 1910.1000)
2. IDLH = The "Immediately Dangerous to Life or Health" concentration
3. Samples collected from on-site monitor wells, April, May, July, 1985

ug/l = micrograms per liter; ppm = parts per million
 (-) = less than; numerical value is the limit of detection for that compound in that medium.

References: California Administrative Code, Title 8, Section 5155
 Patty's Industrial Hygiene & Toxicology, 3rd Edition, 1981
 MIOOSH/OSHA Pocket Guide to Chemical Hazards, 1980

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TABLE A-1 (continued)
HAZARD ASSESSMENT

CONTAMINANT	BHC (BENZENE HEXACHLORIDE)	CHLOROFORM
	Isomers: alpha, beta, delta, gamma (Lindane)	
MEASURED CONCENTRATION MEDIA	Groundwater ³ (ug/l)	Groundwater ³ (ug/l)
MIN. VAL.	-5	760
MAX. VAL.	220 (alpha)	24,000
EXPOSURE ROUTE	Ingestion, inhalation (dust or spray), absorption, contact	Inhalation, ingestion, contact
HAZARD PROPERTY	Toxic	Irritant, toxic, carcinogen, teratogen
HAZARD SPECIFICATIONS		
18 PEL1	Gamma: 0.5 mg/m ³	10 ppm, 50 mg/m ³
IDLH2	1,000 mg/m ³	1,000 ppm
TOXIC EFFECTS	ACUTE - alpha & gamma: CNS stimulant; hyperexcitability, convulsions; beta: CNS depression; CHRONIC: liver, kidney, and lung damage	Skin and eye irritation; headache; vomiting; dizziness; narcosis; liver injury
SYNERGISTIC EFFECTS	Unknown	Unknown
TARGET ORGANS	Eyes, CNS, blood, liver, kidneys, skin	CNS, liver, kidneys, heart, eyes, skin

1. PEL = Maximum permitted 8-hr. time-weighted average concentration of an airborne contaminant (29 C.F.R. 1910.1000)
2. IDLH = The "Immediately Dangerous to Life or Health" concentration
3. Samples collected from on-site monitor wells, April, May, July, 1985

ug/l = micrograms per liter; mg/m³ = milligrams per cubic meter; ppm = parts per million
(-) = less than; numerical value is the limit of detection for that compound in that medium.

References: California Administrative Code, Title 8, Section 5155
Patty's Industrial Hygiene & Toxicology, 3rd Edition, 1981
NIOSH/OSHA Pocket Guide to Chemical Hazards, 1980



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TABLE A-1 (continued)
HAZARD ASSESSMENT

CONTAMINANT	<u>O-DICHLOROBENZENE</u>	<u>P-DICHLOROBENZENE</u>
MEASURED CONCENTRATION MEDIA	Groundwater ³ (ug/l)	Groundwater ³ (ug/l)
MIN. VAL.	None detected	None detected
MAX. VAL.	13	67
EXPOSURE ROUTE	Inhalation, absorption, ingestion, contact	Inhalation, ingestion, contact
HAZARD PROPERTY	Irritant, toxic	Irritant, toxic
HAZARD SPECIFICATIONS		
PEL ¹	50 ppm	75 ppm
IDLH ²		
TOXIC EFFECTS	CNS depression, irritating to eyes, nose; injury to liver, kidney; skin blister	Irritating to skin, throat, eyes; weakness; dizziness; nausea; vomiting; headache; injury to lungs, liver, kidney
SYNERGISTIC EFFECTS	Unknown	Unknown
TARGET ORGANS	Liver, kidneys, skin, eyes	Liver, respiratory system, eyes, kidneys, skin

1. PEL = Maximum permitted 8-hr. time-weighted average concentration of an airborne contaminant (29 C.F.R. 1910.1000)
2. IDLH = The "Immediately Dangerous to Life or Health" concentration
3. Samples collected from on-site monitor wells, April, May, July, 1985

ug/l = micrograms per liter; ppm = parts per million
(-) = less than; numerical value is the limit of detection for that compound in that medium.

References: California Administrative Code, Title 8, Section 5155
Patty's Industrial Hygiene & Toxicology, 3rd Edition, 1981
NIOSH/OSHA Pocket Guide to Chemical Hazards, 1980



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TABLE A-1 (continued)
HAZARD ASSESSMENT

CONTAMINANT	DDT					MONOCHLOROBENZENE	
	MEASURED CONCENTRATION MEDIA					Groundwater ³ (ppb)	Soils ⁴ (mg/kg)
	Soils ⁵ (ppm)	Soils ⁵ (ppm)	Storm water runoff ⁶ (ppm)	Surface water runoff ⁶ (ppm)	Groundwater ⁸ (ug/l)		
MIN. VAL.	NR	0.05	0.0028	---	-0.6	59	-0.3
MAX. VAL.	8,274	2,257	98	0.017297	2,805	180,000	70
EXPOSURE ROUTE	Inhalation, ingestion, absorption, contact					Inhalation, ingestion, contact	
HAZARD PROPERTY	Toxic					Irritant, toxic	
HAZARD SPECIFICATIONS							
20 PEL ¹	1 mg/m ³					75 ppm, 350 mg/m ³	
IDLM ²	N/A					2,400 ppm	
TOXIC EFFECTS	Vomiting; apprehension; excitement; muscle weakness; equilibrium disturbance; convulsions; tremors					Eyes, nose and skin irritation; depression of CNS	
SYNERGISTIC EFFECTS	Synergistic effects shown in animal studies from DDT with aldrin and carbon tetrachloride					Unknown	
TARGET ORGANS	CNS, liver, kidneys, skin, peripheral nervous system					CNS, liver, kidneys, respiratory system, eyes, skin	

1. PEL = Maximum permitted 8-hr. time-weighted average concentration of an airborne contaminant (29 C.F.R. 1910.1000)
2. IDLM = The "Immediately Dangerous to Life or Health" concentration
3. Samples collected from on-site monitor wells, April and May 1985
4. Samples collected off-site, 1981-1983

5. Soil samples collected on-site, April 1985
6. Water samples collected off-site, 1971-1982
7. Mean total concentration, EPA 1982
8. Total concentrations for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT collected from on-site monitor wells, April, May, July, 1985

NR = not recorded; NA = not applicable; ug/l = micrograms per liter; mg/m³ = milligrams per cubic meter; ppm = parts per million; ppb = parts per billion
(-) = less than; numerical value is the limit of detection for that compound in that medium.

References: California Administrative Code, Title 8, Section 5155
Patty's Industrial Hygiene & Toxicology, 3rd Edition, 1981
NIOSH/OSHA Pocket Guide to Chemical Hazards, 1980

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